

1
 $A = \{1, 2, 3\}$ $A \cap B = \{(1, 2), (2, 2), (3, 2), (4, 2)\}$ $A \cap B - B^c = \{(1, 2), (2, 2)\}$
 $B = \{2, 3\}$ $B \cap A = \{(2, 1), (2, 2), (3, 2), (3, 3)\}$

2
 الف) $f(b) = \{(3, m^2), (2, 1), (2, m), (-2, m), (3, m+2), (m, 4)\}$ $m^2 = m+2 \Rightarrow m^2 - m - 2 = 0 \Rightarrow m = \begin{cases} 2 \\ -1 \end{cases}$

3
 if $m=2$ $(2, 1) \neq (2, 4) \Rightarrow$ تابع نیست } $m=2$
 if $m=-1$ $(1, 4) \Rightarrow$ تابع

ب) $g(n) = \{(3, m^2), (2, 1), (m, 4), (3, m+2), (-2, m), (-1, 3)\}$ $m^2 = m+2 \Rightarrow m = \begin{cases} 2 \\ -1 \end{cases}$

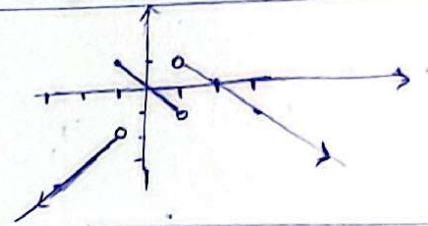
if $m=2$ $(2, 1) \neq (2, 4) \Rightarrow$ تابع نیست

if $m=-1$ $(-1, 3) \neq (-1, 4) \Rightarrow$ تابع نیست

4
 $f(n) = \begin{cases} n^2 - 1; n \leq 1 \\ an + b; 1 < n \leq 2 \\ n^3; n > 2 \end{cases}$ $n=1 \Rightarrow 1-1=0 \Rightarrow a+b=0$ $n=2 \Rightarrow 1=2a+b$ $\begin{cases} a+b=0 \\ 2a+b=1 \end{cases} \Rightarrow a=1, b=-1$

5
 $f(n) = \begin{cases} 2n-3; n \geq k \\ 4-3n; n \leq k \end{cases} \Rightarrow 2k-3 = 4-3k \Rightarrow 5k=7 \Rightarrow k = \frac{7}{5}$

6
 $f(n) = \begin{cases} -n, 2: n > 1 \rightarrow \frac{1}{1-2} = -1 \\ -1, 2: n < 1 \rightarrow \frac{-1-2}{1-2} = 1 \end{cases}$ $D_f = \mathbb{R} - \{1\}$ $R_f = (-\infty, 1]$



7
 الف) $xy^3 + n^2 + 1 = 0 \Rightarrow xy = -n^2 - 1 \Rightarrow \begin{cases} xy_1^3 = -n^2 - 1 \\ xy_2^3 = -n^2 - 1 \end{cases} \Rightarrow y_1^3 = y_2^3 \Rightarrow y_1 = y_2$ تابع است

ب) $n^2 + xy^2 - 2n - xy + 1 = 0$

$\Rightarrow (n-1)^2 + (xy-3)^2 = 0 \Rightarrow (xy-3)^2 = -(n-1)^2 \Rightarrow$

$xy-3 = -n+1 \Rightarrow \frac{n}{1} = \frac{0}{1} = \frac{1}{1} = \frac{-1}{1} \rightarrow$ عکس از $\rightarrow$ تابع است

8
 $\sin y = y \sin n \rightarrow \begin{cases} n=0 \rightarrow \sin 0 = 0 \\ \sin n = 0 \end{cases} \rightarrow$ تابع است

ب) $\sqrt{\frac{n}{y}} + \sqrt{\frac{y}{n}} = 2 \xrightarrow{\text{مربع}} \frac{n}{y} + \frac{y}{n} + 2\sqrt{1} = 4$

$\frac{n}{y} + \frac{y}{n} = 2 \Rightarrow \frac{n^2 + y^2}{ny} = 2 \Rightarrow n^2 + y^2 - 2ny = 0 \Rightarrow (n-y)^2 = 0 \Rightarrow n=y$ تابع است ✓

$$\text{الف) } y = \sqrt{\frac{n-1}{n-2}} + \sqrt{\frac{2-n}{n}}$$

$$\frac{n-1}{n-2} \geq 0 \Rightarrow \frac{1}{+} - \frac{2}{-} +$$

$$\frac{2-n}{n} \geq 0 \Rightarrow -\frac{2}{-} + \frac{1}{+}$$

$$\text{① } (0, 1] \quad \text{② } (1, \infty)$$

$$\text{① } (-\infty, 1] \cup (2, +\infty) \cap \text{② } \cap \text{①} \Rightarrow (2, 1]$$

$$\text{ب) } \sqrt{n} + \sqrt{y-1} = \sqrt{2} \Rightarrow \sqrt{y-1} = \sqrt{2} - \sqrt{n} \Rightarrow y-1 = 2 + n - 2\sqrt{2n}$$

$$y = n + 1 - 2\sqrt{2n}$$

$$\sqrt{2n} \geq 0 \Rightarrow n \geq 0 \Rightarrow D_y = [0, +\infty)$$

$$\sqrt{2} - \sqrt{n} \geq 0 \Rightarrow n \leq 2$$

$$\text{الف) } y = \frac{\sqrt{n^2 - 4n + 9}}{\sqrt{n - 10n + 19}} \rightarrow (n/1)(n/9) \Rightarrow \frac{1}{+} - \frac{9}{-} \Rightarrow \text{① } (-\infty, 1] \cup [9, +\infty)$$

$$\frac{1}{+} - \frac{9}{-} \Rightarrow (-\infty, 1] \cup [9, +\infty) \text{ ②}$$

$$\text{①} \cap \text{②} \Rightarrow (-\infty, 1]$$

$$\text{ب) } y = \sqrt{\frac{n^2 - 4n + 9}{n^2 - 10n + 19}} \Rightarrow \frac{n^2 - 4n + 9}{n^2 - 10n + 19} \geq 0$$

$$\rightarrow (n/1)(n/1) \Rightarrow \frac{1}{+} - \frac{1}{-} \Rightarrow (-\infty, 1] \cup [9, +\infty)$$

$$\frac{n}{y} \mid \frac{1}{+} - \frac{1}{-} + \frac{9}{-} - \frac{1}{+} + \frac{1}{+} \Rightarrow D_y = (-\infty, 1] \cup (9, 9] \cup (19, +\infty)$$

$$\text{الف) } y = \sqrt{\frac{2n^2 - 5n + 2}{3n^2 - 4n + 2}} \Rightarrow \frac{2}{+} - \frac{5}{-} + \frac{2}{+} \Rightarrow (-\infty, 1] \cup [\frac{2}{3}, +\infty) \text{ ①}$$

$$\frac{2}{+} - \frac{5}{-} + \frac{2}{+} \Rightarrow (-\infty, 1] \cup [\frac{2}{3}, +\infty) \text{ ②}$$

$$\text{①} \cap \text{②} \rightarrow D_y = (-\infty, 1] \cup [\frac{2}{3}, +\infty)$$

$$\text{ب) } y = \sqrt{\frac{2n^2 - 5n + 2}{3n^2 - 4n + 2}} \Rightarrow \frac{2}{+} - \frac{5}{-} + \frac{2}{+} \Rightarrow (-\infty, 1] \cup [\frac{2}{3}, +\infty)$$

$$\frac{1}{+} - \frac{5}{-} + \frac{2}{+} \Rightarrow (-\infty, 1] \cup [\frac{2}{3}, +\infty)$$

$$D_y = (-\infty, 1] \cup (1, \frac{2}{3}) \cup [\frac{2}{3}, +\infty)$$

$$\text{②}$$

$$\text{③}$$